

# NASA TECH BRIEF

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### **Reliability Data for Electronic and Electromechanical Components: A Report**

A set of circuit-design and parts-reliability techniques has been developed to meet the demanding requirements of the Jet Propulsion Laboratory spacecraft efforts. This work has resulted in a conveniently organized and clearly presented collection of reliability data on components used throughout the electronic industry. The following 10 classes of parts have been covered:

Capacitors	Microcircuits
Crystals	Relays
Diodes	Fixed Resistors
Fuses	Transformers
Inductors	Transistors

The report contains a separate section for each class of parts. Each section includes a discussion of inherent failure modes, screening rationale, general screening requirements, derating criteria, and stress-analysis data.

As an example of the kind of information available from the report, the failure mode segment of the section on capacitors covers: paper/film dielectrics, ceramics, tantalum/aluminum electrolytics. For each type of capacitor, the type of inherent failure mode (e.g., ruptured dielectric, defective termination, impaired seal, ...) is presented along with the resulting failure (e.g., short, reduced capacitance, low insulation resistance, ...).

The rationale behind screening requirements is discussed in terms of causes, critical component characteristics, and design requirements. This is followed by general screening requirements for each

type of component (in this case, each type of capacitor).

The derating factor (the ratio of maximum stress for reliable operation to the rated stress) is presented for each type of capacitor. Finally, a discussion of the data necessary for stress analysis is included.

A similar set of data is presented for each class of components, capacitors through transistors. The information is presented in tabular or list form where appropriate. Because of its broad application and clarity of presentation, this report will be useful to small or large organizations that must use or evaluate electronic components.

#### **Note:**

Requests for further information may be directed to:

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